Docket No. BIO-103

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Assaf Govari
Serial No.	:	09/621,322
Filed	:	July 20, 2000
Title	:	MEDICAL SYSTEM CALIBRATION STATIC METAL COMPENSATION
Art Unit	:	3737
Examiner	:	Eleni M. Mantis Mercader

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September 4, 2003
(Date of Deposit)

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(Signature)

September 4, 2003
(Date of Signature)

Honorable Commissioner of Patents
Washington, D.C. 20231

BRIEF ON APPEAL

(1) **Real Party in Interest**

Biosense, Inc., a Delaware Corporation, is the real party in interest.

(2) **Related Appeals and Interferences**

None.

(3) **Status of Claims**

Claims 1-21 of the present application have been finally rejected on May 21, 2003 and this appeal is taken from these claims. There are no other claims at issue in this application.

(4) Status of Amendments

No amendments have been filed subsequent to the issuance of the Final Rejection dated May 21, 2003.

(5) Summary of the Invention

The present invention is a medical device tracking system 20 (Fig. 1, Fig. 2 and Fig. 5) that generates and uses magnetic fields for tracking the position of a medical device (such as a catheter) and method for calibrating the medical device tracking system 20 (Fig. 12 and Fig. 13). The system 20 generates a magnetic field by radiators or generators 56, 58 and 60 (Fig. 2) and in alternative embodiments 56a, 58a and 60a (Fig. 7); 56b, 58b and 60b (Fig. 8); and 56c, 58c and 60c (Fig. 9).

In one embodiment of the method for calibrating the system 20 in accordance with the present invention, the novel method is outlined in Fig. 12 and comprises a plurality of novel method steps. One of these novel steps is defining a mapping volume (Fig. 5 and Fig. 11). For example, the mapping volume defined by the system 20 is a 20 cm^3 cube. See Specification, Page 30, Lines 11-21. The mapping volume is a volume created by and defined by the magnetic fields created by the radiators or generators mentioned above. See Specification, Page 14, Line 27 – Page 15, Line 10.

Another novel step of the Applicant's invention, is to place a metallic object within the mapping volume. As clearly detailed in the Applicant's Specification on Page 1, Lines 7-11 and Page 33, Lines 27-30, the metallic object placed within the mapping volume is a non-moving or static object such as those objects which are normally found within the sterile field of an operating room. See Specification, Page 34, Lines 24-31. One example of one of these type of metallic objects which are commonly located within the sterile field of a patient undergoing some type of medical procedure, is the C-arm of a fluoroscopic device. See Specification, Page 34, Lines 5-11. The purpose of the novel calibration method is to account for effects of interferences from these metallic objects within the sterile field of the patient and to compensate for the effects of the interference on the medical device tracking system 20.

Another novel step in accordance with the present invention is to align a sensor, such as a test position sensor 100 at a first point within the mapping volume and measuring the magnetic field at the first point with the sensor in order to establish a first coordinate position (X_i, Y_i, Z_i). The test position sensor 100 is operatively connected to a positioning device such as a robot arm (Claim 8). See Specification, Page 29, Lines 13-28. The test position sensor 100 is used to sense the presence of the non-moving or static metallic object within the mapping volume (created by the generated magnetic fields).

Another novel step in accordance with the present invention is to move the sensor 100 to a next point ($X_i + dx$, $Y_i + dy$, $Z_i + dz$) along one coordinate axis by an added distance component (dx, dy, dz) and to measure the magnetic field at the next point to establish a next coordinate position. The points used to measure the magnetic field at each point (such as the first point and the next point) are coordinate points along the coordinate axis (X, Y, Z) such as the coordinate axes along vertices of a cube. See Specification, Page 35, Lines 1-17. These are coordinate positions defined by the coordinates axes (X, Y, Z).

Another novel step in accordance with the present invention is to interpolate the magnetic field at an intermediate point between the first coordinate position and the next coordinate position to establish an interpolated intermediate coordinate position. Then, a position difference is determined between the interpolated intermediate coordinate position and an actual intermediate coordinate position wherein the position difference is compared to an error limit. And, the coordinate position (X_i, Y_i, Z_i) of the next point is set as a point defined as ($X_i = X_i + dx$, $Y_i = Y_i + dy$, $Z_i + dz$) if the position difference is within the error limit and the preceding steps are repeated along another coordinate axis. Moreover, if the position difference is not within the error limit, the added distance component (dx, dy, dz) is decreased and the preceding steps are repeated along the same coordinate axis.

This calibration method in accordance with the present invention is a method that also incorporates interpolation as one of its novel method steps and is set forth in Applicant's Claims 1-10 and depicted and described in Fig. 12 and Specification, Page 34, Line 24 – Page 37, Line 31.

A second embodiment of the Applicant's novel method for calibrating a medical system that uses generated magnetic fields to track a position of a medical device is a method that also comprises novel extrapolation method steps as claimed in Applicant's Claims 11-21 and depicted and described in Fig. 13 and Applicant's Specification, Page 38, Line 1 – Page 39, Line 7.

The method comprises the steps of defining a mapping volume within the generated magnetic field and placing a metallic object within the mapping volume. A sensor 100 is aligned at a first point within the mapping volume and the magnetic field is measured at the first point with the sensor in order to establish a first coordinate position (X_i, Y_i, Z_i). The magnetic field of a next point $(X_i + dx, Y_i + dy, Z_i + dz)$ is extrapolated along one coordinate axis by an added distance component (dx, dy, dz). And, the coordinate position is calculated at the extrapolated next point based on the extrapolated magnetic field in order to establish an extrapolated coordinate position.

Additionally, a position difference between the extrapolated coordinate position and the actual coordinate position of the next point is determined and the position difference is compared to an error limit.

Additionally, the added distance component (dx, dy, dz) is set according to a predetermined distance if the position difference is within the error limit wherein the sensor is aligned at a new point within the mapping volume along another coordinate axis and the magnetic field is measured at the new point with the sensor in order to establish a new point coordinate position and the steps listed above are repeated along the other coordinate axis.

However, if the position difference is not within the error limit, the added distance component (dx, dy, dz) is set by decreasing the value of the added distance component and an intermediate point is established between the first point and the next point as the first position and the above mentioned steps are repeated along the same coordinate axis.

Again, both embodiments of the Applicant's novel calibration method are used to account for the interference effects of static or non-moving metallic objects that are normally present in the sterile field or operating room while a patient is undergoing a medical procedure.

(6) Issues

Whether Claims 1-7 and 10-19 are unpatentable under 35 U.S.C. § 103 (a) over U.S. Patent No. 6,161,032 (Acker).

Whether Claims 8-9 and 20-21 are unpatentable under 35 U.S.C. § 103 (a) over Acker as applied to Claims 7 and 19 and further in view of U.S. Patent No. 5,086,401 (Glassman et al.).

(7) Grouping of Claims

All claims stand or fall together for the grounds of the rejections.

(8) Argument

A. U.S. Patent No. 6,161,032 (Acker) is being improperly applied against the Applicant's present invention in an effort to preclude patentability in clear violation of 35 U.S.C. § 103 (c).

As mentioned above, Applicant's claimed present invention of Claims 1-7 and 10-19 have been rejected by the Examiner under 35 U.S.C. § 103 (a) as being unpatentable over Acker. The Applicant notes that Acker was filed before the filing date of the present invention but had issued on December 12, 2000 which is after the Applicant's filing date of July 20, 2000 for the present invention. Accordingly, it is assumed that the basis for the Examiner's rejection under 35 U.S.C. § 103 (a) is due to the fact that Acker would qualify as prior art under 35 U.S.C. § 102 (e).

35 U.S.C. § 103 (c) states:

> Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this

> title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Additionally, as per the Applicant's assignment for the present invention (Reel/Frame: 011202/0212 recorded on October 20, 2000), it is clear that Applicant's present invention is assigned to Biosense, Inc. Moreover, it is also clear that U.S. Patent No. 6,161,032 (Acker) has been and still remains assigned to Biosense, Inc. as well, e.g. "the same person" for purposes of 35 U.S.C. § 103 (c). Accordingly, there is no doubt that the Examiner has completely ignored that U.S. Patent No. 6,161,032 (Acker) and the Applicant's present invention were at the time of the Applicant's invention owned by the same person and subject to an obligation to assignment to the same person. Therefore, this rejection is improper and should be dismissed.

B. Even without a 35 U.S.C. § 103 (c) exception, Acker does not describe, suggest or even infer the Applicant's claimed present invention and actually teaches away from the Applicant's invention.

As set forth in the Examiner's final rejection dated May 21, 2003, the Examiner outlines what is referred to as "two major issues presented by the Applicant" and presents reasoning based on these perceived issues as to why the Applicant's present invention should be considered obvious in view of Acker. The Applicant would like to address each of these two perceived issues and expose the flawed reasoning behind each below.

The first issue identified by the Examiner is: "(1) whether extrapolation and interpolation are used in order to calibrate the location and orientation of the surgical catheter having a transducer or position sensor." The Examiner has also stated that both "extrapolation and interpolation are taught in Acker in order to calibrate the location and orientation of the surgical catheter having a transducer or position sensor." The Examiner has even gone to the extent of reproducing Fig. 4 from Acker (shown on Page 3 of the Final Rejection dated May 21, 2003) and has stated:

> Applicant's attention is particularly invited, to Figure 4, wherein the probe field transducer within the mapping field space can be utilized in the calibration step when the movable field transducer is placed in the various

> calibration sockets (314) at known positions, and by moving the probe tip (28) from socket to socket, the same method is applied of providing an iteration procedure for calibration that is within an acceptable error rate and wherein the probe field transducer replaces the calibration transducers (see col. 13, lines 6-18). Since there are three reference assemblies (50A, 50B and 50C), necessarily one of them will be at an intermediate position. For example, the calibration sockets of 50B are at an intermediate location between 50A and 50C where the probe tip is touched and located, and an iterative process is performed as stated above, to establish an accepted error limit. In addition, Acker '032 teaches that the reference field transducers (100A, 100B and 100C) can themselves be calibration transducers and if coil 100A is energized, the field can be detected by reference field transducers 100B and 100C (see col. 10, lines 24-30).
>
> Therefore, Acker '032 teaches that the probe field transducer/sensor when placed in the socket 314 of assembly 50A, can detect the magnetic fields transmitted by assemblies 50B and 50C, and the measured position of the probe on the basis of the detected fields can be compared with respect to the actual position of the socket wherein the probe was placed, and a determination can be made based on how the measurement compares to the estimated value and if it falls within the accepted error limit. The whole procedure is an extrapolation based procedure because estimations are determined from the known locations of the transducers or assemblies of interest (see col. 8, lines 64-67; col. 9, lines 1-67; col. 10, lines 1-30; wherein estimation procedures are discussed). Furthermore, as discussed above, when the position and orientation of the probe placed on assembly 50B is estimated with respect to the assemblies 50A and 50C, the whole procedure is necessarily an interpolation since the position of assembly 50B is intermediate or in-between assemblies 50A and 50C.

The Applicant would like to point out that the calibration method described and shown in Fig. 4 of Acker relates to a calibration method for sockets 314 for each RF assembly 50A, 50B and 50C, and, that the Acker calibration method is clearly outside of the "mapping space", i.e. outside of the mapping volume as clearly depicted in Fig. 4.

Also, there is not any teaching whatsoever that the Acker calibration method is directed to accounting for the interference effects of static, non-moving metallic objects located within its mapping space or mapping volume.

As detailed previously, the Applicant's present invention is a novel calibration method (Claim 1 and Claim 11) that is used to calibrate a medical system capable of

generating a magnetic field for tracking the position of a medical device that is concerned with not only calibrating "within the mapping volume", but also for calibrating its system in order to account for a metallic object that is placed within the mapping volume. Thus, it is clear that the calibration method described by Acker and depicted in Fig. 4 of Acker (conducted outside of the mapping volume and with no ability to account for metallic objects present within its mapping volume), is entirely different and not related in any manner to the novel calibration method of the Applicant's claimed invention. Accordingly, as described and shown, the Acker reference actually teaches away from the Applicant's claimed present invention.

As set forth in *In re Gurley*, 27 F.3d 551; 31 USPQ 2d 1130 (Fed. Cir. 1994):

> A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be in a direction divergent from the path that was taken by Applicant.

It is important to note that Acker sets a direction that is not only divergent, but 180 degrees opposite from the path taken by Applicant's claimed present invention, and thus, teaches away from the Applicant's novel invention of Claims 1-10 and Claims 11-21.

Furthermore, the Applicant would also like to point out that Acker neither describes, suggests or infers additional novel calibration steps such as interpolating the magnetic field at an intermediate point between two coordinate positions; determining the position difference between the interpolated intermediate coordinate position and the actual intermediate coordinate position; comparing the position difference to an error limit; and either repeating these steps along another coordinate axis if the position difference is within the error limit or decreasing the value of the added distance component and repeating these steps along the same coordinate axis if the position difference is not within the error limit (Claim 1); or the extrapolation steps of Claim 11.

The second major alleged issue identified by the Examiner is that "(2) the transducer position sensor is a metallic object." The Examiner's rationale is stated as follows:

> The coils used in the system including the one in the probe used as a sensor is stated in Acker '032 to be as those produced by MINCO (see col. 6, lines 29-45).
>
> The MINCO coils, which as described in Acker '032, typically used as heater coils are made out of metals. Therefore, Acker '032 by teaching use of a MINCO coil as a catheter sensor, inherently teaches a sensor which is a metallic coil/object.

Although it is a fact that the catheter sensor used in Acker is made of a MINCO coil (which is a metallic coil) this has absolutely nothing to do with the Applicant's claimed present invention and certainly does not render the Applicant's claimed present invention obvious.

Upon reading Applicant's claimed invention of Claim 1 and Claim 11, it is clear that Applicant's novel method is not at all concerned with trying to detect metal material of its system sensor (a ridiculous proposition). But rather, is a calibration method that uses a position sensor 100 (also a coil) to calibrate its medical system capable of tracking the position of a medical device wherein the system tracks the medical device using generated magnetic fields. As distinctly claimed (and described), the position sensor 100 is used in order to calibrate its medical system in the presence of a metallic object placed (or which happens to be present) within the mapping volume.

It is clear that Applicant's claimed invention comprises separate method steps having distinct claimed elements, i.e. (1) claimed element is a metallic object (static or non-moving metallic object such as those commonly found within a patient's operating room) and (2) a sensor 100 which is used to track a position of a medical device when used within a generated magnetic field. Accordingly, if one were to try to apply the teachings of Acker against the Applicant's claimed invention, this would mean that this person would be attempting to calibrate their medical system using its sensor and trying to account for interference of this position sensor caused by the position sensor itself. Not only is this not claimed in Applicant's claimed invention of Claim 1 and Claim 11, but is a completely unreasonable application of the teachings of Acker against the Applicant's claimed invention. The Examiner's use of Acker in this rejection is not only heavily flawed but is completely absurd especially since it is clear that the Applicant's claimed invention is directed toward

calibrating a medical system in order to count for the interference effects of a metallic object present or placed within the mapping volume of the medical tracking system other than the sensor itself.

C. The Examiner's rejection that Applicant's Claims 8-9 and 20-21 are obvious over Acker in view of Glassman et al. is a classic use of hindsight.

In establishing a basis for denying patentability of an invention, the initial burden rests with the Examiner. *In re Piasecki*, 745 F.2d 1468; 223 USPQ 785 (Fed. Cir. 1984). Thus, it is incumbent upon the Examiner to provide a reason why of ordinary skill in the art would have been led to modify a prior art reference or to combine teachings in order to arrive at the claimed invention. *Ex Parte Clapp*, 227 USPQ 972 (BPAI 1985). Moreover, this reason must stem from some teaching, suggestion or inference in the prior art or knowledge generally available and not from the Applicant's disclosure. *Uniroyal, Inc., v. Rudkin-Wiley Corp.*, 837 F.2d 1044; 5 USPQ 2d 1434 (Fed. Cir. 1988). As stated in *W.L. Gore and Associates, Inc., v. Garlock, Inc.*, 721 F.2d 1540; 220 USPQ 303 (Fed. Cir. 1983):

> [t]o imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

The Federal Circuit's case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. *See, e.g., C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998) (describing "teaching or suggestion or motivation [to combine]" as an "essential evidentiary component of an obviousness holding"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998) ("the Board must identify specifically . . . the reasons one of ordinary skill in the art would have been motivated to select the references and combine them"); *In re Fritch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (examiner can satisfy burden of obviousness in light of combination "only by showing some objective teaching [leading to the combination]"); *In re Fine*, 837 F.2d 1071, 1075, 5

USPQ2d 1596, 1600 (Fed. Cir. 1988) (evidence of teaching or suggestion "essential" to avoid hindsight); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297, 227 USPQ 657, 667 (Fed. Cir. 1985) (district court's conclusion of obviousness was error when it "did not elucidate any factual teachings, suggestions or incentives from this prior art that showed the propriety of combination"). *See also Graham*, 383 U.S. at 18, 148 USPQ at 467 ("strict observance" of factual predicates to obviousness conclusion required). Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. *See, e.g., Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time."). In this case, it appears that the Examiner has fallen into the hindsight trap.'

As detailed above, not only does Acker fall completely short of describing, suggesting or inferring the novel method steps of the Applicant's claimed present invention, there is absolutely no teaching or suggestion in Acker that the Applicant's novel method steps can be accomplished using a robot to control movement of the sensor. This is also admitted by the Examiner in recent remarks.

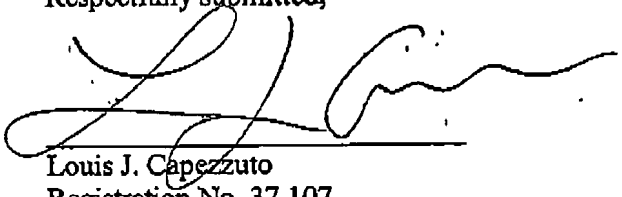
Additionally, Glassman et al. has absolutely nothing to do with calibrating a medical system (also admitted by the Examiner), but rather is limited specifically to image-directed robotic surgery. It is also clear that the Examiner has neither provided nor can point to any objective teaching in any of these references that one of ordinary skill in this field should combine these references in an effort to arrive at the Applicant's novel claimed present invention. Additionally, even if one of ordinary skill were to attempt to combine these references in the manner suggested by the Examiner, they still would never arrive at the Applicant's novel claimed present invention for the numerous reasons mentioned above. Accordingly, the only way one would ever be able to arrive at the Applicant's novel claimed present invention is if the Applicant's own disclosure is used as a blueprint for the skilled artisan to follow. Thus, the Applicant can only conclude that the Examiner is also using the Applicant's

own disclosure against its claimed invention as a blueprint based on the significant shortcomings of the teachings of the cited prior art references. Accordingly, this is a classic use of hindsight and should be prohibited. Therefore, this rejection is without merit and should also be overruled.

D. Summary

Accordingly, for the reasons detailed above, it is clear that the Applicant's claimed present invention is neither described, suggested or inferred in any of these prior art references. And, the Applicant's claimed present invention is both patentably distinct and non-obvious over these references and the final rejection should be overruled.

Respectfully submitted,



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(9) APPENDIX

Claim 1. A method for calibrating a medical system capable of generating a magnetic field for tracking a position of a medical device, the method comprising the steps of:

(a) defining a mapping volume within the generated magnetic field;

(b) placing a metallic object within the mapping volume;

(c) aligning a sensor at a first point within the mapping volume and measuring the magnetic field at the first point with the sensor to establish a first coordinate position (X_i, Y_i, Z_i);

(d) moving the sensor to a next point ($X_i + dx$, $Y_i + dy$, $Z_i + dz$) along one coordinate axis by an added distance component (dx, dy, dz) and measuring the magnetic field at the next point to establish a next coordinate position;

(e) interpolating the magnetic field at an intermediate point between the first position and the next coordinate position to establish an interpolated intermediate coordinate position;

(f) determining the position difference between the interpolated intermediate coordinate position and an actual intermediate coordinate position;

(g) comparing the position difference to an error limit;

(h) setting (X_i, Y_i, Z_i) of the next point as ($X_i = X_i + dx$, $Y_i = Y_i + dy$, $Z_i = Z_i + dz$) if the position difference is within the error limit and repeating steps (d) – (g) along another coordinate axis; and

(i) setting the added distance component (dx, dy, dz) by decreasing the value of the added distance component if the position difference is not within the error limit and repeating steps (d) – (g) along the same coordinate axis.

Claim 2. The method according to Claim 1, including using the calibration method for the entire mapping volume.

Claim 3. The method according to Claim 2, wherein the error limit is ≤ 1 mm.

Claim 4. The method according to Claim 3, including moving the sensor a distance ranging from about 2 cm to about 3 cm.

Claim 5. The method according to Claim 4, including moving the sensor according to the vertices of a cube.

Claim 6. The method according to Claim 5, wherein the entire mapping volume comprises a plurality of cubes.

Claim 7. The method according to Claim 6, wherein each cube is defined by measurements at at least four different vertices.

Claim 8. The method according to Claim 7, wherein the sensor is moved by a robot.

Claim 9. The method according to Claim 8, wherein the mapping volume is approximately 20 cm X 20 cm X 20 cm or $(20\ cm)^3$.

Claim 10. The method according to Claim 1, including decreasing the value of the added distance component in step (i) through division by a factor of two ($X_i + dx/2$, $Y_i + dy/2$, $Z_i + dz/2$).

Claim 11. A method for calibrating a medical system capable of generating a magnetic field for tracking a position of a medical device, the method comprising the steps of:

(a) defining a mapping volume within the generated magnetic field;

(b) placing a metallic object within the mapping volume;

(c) aligning a sensor at a first point within the mapping volume and measuring the magnetic field at the first point with the sensor to establish a first coordinate position (X_i, Y_i, Z_i);

(d) extrapolating the magnetic field of a next point ($X_i + dx$, $Y_i + dy$, $Z_i + dz$) along one coordinate axis by an added distance component (dx, dy, dz);

(e) calculating the coordinate position at the extrapolated next point based on the extrapolated magnetic field to establish an extrapolated coordinate position;

(f) determining the position difference between the extrapolated coordinate position and the actual coordinate position of the next point;

(g) comparing the position difference to an error limit;

(h) setting the added distance component (dx, dy, dz) according to a predetermined distance if the position difference is within the error limit, aligning the sensor at a new point within the mapping volume along another coordinate axis and measuring the magnetic field at the new point with the sensor to establish a new point coordinate position and repeating steps (d) – (g) along the other coordinate axis; and

(i) setting the added distance component (dx, dy, dz) by decreasing the value of the added distance component if the position difference is not within the error limit and establishing an intermediate point between the first point and the next point as the first position and repeating steps (d) – (g) along the same coordinate axis.

Claim 12. The method according to Claim 11, including using the calibration method for the entire mapping volume.

Claim 13. The method according to Claim 12, wherein the error limit is $\leq$ 1 mm.

Claim 14. The method according to Claim 13, wherein the predetermined distance is a distance ranging from about 2 cm to about 3 cm.

Claim 15. The method according to Claim 13, wherein the predetermined distance is approximately 3 cm.

Claim 16. The method according to Claim 14, wherein the intermediate position is defined as $(X_i + dx/2, Y_i + dy/2, Z_i + dz/2)$

Claim 17. The method according to Claim 16, including moving the sensor according to the vertices of a cube.

Claim 18. The method according to Claim 17, wherein the entire mapping volume comprises a plurality of cubes.

Claim 19. The method according to Claim 18, wherein each cube is defined by measurements at at least four different vertices.

Claim 20. The method according to Claim 19, wherein the sensor is moved by a robot.

Claim 21. The method according to Claim 20, wherein the mapping volume is approximately 20 cm X 20 cm X 20 cm or $(20\ cm)^3$.